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Measuring Service Contract Performance: Preliminary Findings on Effects of Service Complexity, Managerial Capacity, and Prior Relationship

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Abstract

Services contracts have a distinct set of challenges relating to the uncertainty and the challenges of measuring performance. Past researchers identified three overarching characteristics of interest: service complexity, management capacity, and the relationship between the buyer and the contractor. Researchers have often turned to surveys of government contracting personnel to take on the challenge of measuring service contract performance. This report takes a large-dataset, quantitative approach to looking at service

contract outcomes derived from information in the publicly available Federal Procurement Data System. This iteration of the report focuses on a newly developed outcome: the extent to which the government exercised available options as an indication of positive performance outcomes.

Introduction

Services contracts have long been understood to be distinct in key ways from their product counterparts in ways that add ambiguity and their own sets of challenges. Products are countable or otherwise objectively measurable, and while testing to see whether they meet requirements can prove complicated and controversial, there is at least a common item being argued over and measured. Service contracts inherently put more attention on the qualitative aspects of labor. Simple service contracts, like transportation or custodial services, have straightforward results to evaluate but can nonetheless introduce a host of concerns if, for example, taking place in contingency environments such as Afghanistan. Even familiar services like construction often must be evaluated not just on the quality of the final product but also the creation process which is often not contained in an easily measurable outcome and can bring a host of disruptions. The most challenging services can be those that do something new or ill-defined, where trying to put all the details in the contract at the outset might not only be an exercise in futility, but actively counterproductive. In such situations, the buyer and contractor have to solve problems together that were not fully anticipated when the contract was initiated.

For the U.S. federal government, in particular the Department of Defense (DoD), services constitute a significant portion of contract spending but are often a lower priority from a regulatory and policy perspective. This is even more so the case when R&D is classified as a service, as it is for the purposes of this iteration of the paper. This observation comes not just from critics in Congress, which has a range of concerns about services contracts, but also from the DoD itself where improving services acquisition tradecraft was a prominent part of the Better Buying Power initiatives. Some of the history of these acquisition reform efforts can be seen in McCormick et al. (2015), *Measuring the Outcomes of Acquisition Reform by Major DoD Components*, but suffice to say the problems of services contracting have long been a known issue.

While the prioritization of major defense acquisition programs over services acquisition is specific to the DoD, the challenges of services contracting are universally acknowledged—in the private sector, by sectors and levels of government, and in nonprofit organizations. This study takes a new quantitative look at services contract performance by employing the Federal Procurement Data System, an open source transaction database with records of more than a million service contracts within the past decade. This large dataset approach builds on past research regarding the public and private sector that often relied on surveys with smaller sample or case studies.

Scope

The research project seeks to answer the following questions:

- Under what circumstances are services contracts likely to encounter challenges, as measured by terminations and cost ceiling breaches, or prosper, as measured by the exercising of options?
- What services contracting policy choices influence these outcomes, for better or worse?

This iteration of the study focuses specifically on DoD contracts within a 2008 to 2015 study period. Past CSIS work with the contract dataset have covered both products and services contracts, but to better focus on the challenges of services contracting, this effort has focused on service contract complexity, contract management capacity, and the relationship between the contractor and the buyer. Past CSIS studies have looked at the performance outcomes of terminations and ceiling breaches, and the final technical deliverable for this project will as well. However, for reasons of novelty and brevity, this paper focuses on a performance outcome the study team newly explored in this project: the choice of whether to exercise contract options and the implication of positive performance when the acquirer chooses to do so.

Literature Review

This literature review will clearly delineate the different aspects of services contract management in several sections. In general, this includes contract complexity, management capacity, and trust/relationships. Additionally, there are some service specific considerations that will be of use to this study. Finally, this review includes only the academic theory and evidence. It does not include GAO reports, but including these reports in the final product will provide a level of context for our findings and conclusions that will be invaluable. Useful tables have been included from the literature because they have value in articulating some of the more ambiguous concepts.

There are incredibly few comprehensive definitions for contract management. For a broad definition, contract management may be defined as

> all activities performed by the government … that are relevant to contracts with private or nonprofit organizations … such as writing or creating the Invitation to Bid or Request for Proposal, devising a rating system for bid responses, rating the bid responses, awarding the contract, additional negotiations leading to a signed contract, and contract administration. (Lawther, 2002)

Contract Complexity

It stands to reason that the relative complexity of a given contract is a determinant of the level of cost (in labor, funds, or both) required by the government to effectively manage it, and in this vein, the literature delineates between low-, mid-, and high-complexity. For low-complexity contracts, “specificity and monitoring are simple and undemanding” (Joaquin & Greitens, 2012, p. 809). “Under mid-complexity scenarios, requests for proposals are more detailed and specific, and managers need to possess more technical expertise” (Joaquin & Greitens, 2012, 809). For highly complex services, and when understanding of the service delivery means are not clear, the agency and the contractor should enter into a true public-private partnership and recognize that the service to be provided will evolve in a dynamic manner, echoing studies by Fernandez (2007, 2009; Joaquin & Greitens, 2012, p. 809).

High levels of task complexity and uncertainty at the federal level can be considered as those tasks where the government requires a definitively new service or capability. From the defense perspective, this could be new software architecture, an emerging hardware technology, or specified research and development. Such high-complexity contracts complicate the ability of contract managers to write contractual requirements that are comprehensive and highly detailed, which most literature has presumed was a necessity in successful contracting. The results are mixed on the need for specificity. Brown and Potoski (2003, 2006) find support for this in overall contracting, while Fernandez (2007, 2009)

determines that asset specificity is unrelated to service contracting success. Moreover, even moderate levels of complexity and uncertainty increase the likelihood that some of the contract requirements will be erroneous. A successful contract, then, may require that the principal and agent interact frequently to make "necessary adjustments in work processes, performance standards, quantities, and prices" and fill in the gaps in the contract (Fernandez, 2007, p. 1127). One additional consideration is that, contracting for management tasks can carry a large amount of risk, specifically that the government will enter into a monopoly relationship with the vendor (Brown & Potoski, 2006, p. 327).

Management Capacity

While there are various definitions of management capacity in the literature, many of them do not create a complete picture of the actual scope of managing contracts. The all-encompassing definition, as is required here, is provided by Brown and Potoski (2003):

> Contracting is not a one-size-fits-all proposition. The success or failure of any alternative service-delivery arrangement likely depends on how well governments can manage the entire contract process, from assessing the feasibility of contracting through implementation to monitoring and evaluation-activities that require strong government contracting capacity. Governments investing in contract-management capacity may be better positioned to harness the promise of effective contracting while avoiding its pitfalls. (p. 153).

Governments invest in contract-management capacity because contracting is a complex process, fraught with potential problems and pitfalls. In fact, "governments can respond to poor conditions by investing in the managerial capacity to identify suitable situations for contracting, negotiate strong contracts, and monitor vendor performance" (Brown & Potoski, 2003, p. 162) Romzek and Johnston (2002) determine seven factors that positively influence service-contracting effectiveness: competition among providers, resource adequacy, planning for performance measurement, training for state contract managers, evaluation of contractor staffing capacity, evaluation of contractor financial management capacity, and theoretical rationale for reform. These and other responsibilities of the government as contract managers have been discussed, but they often fall into general bins. The overall literature expresses a range of opinions on the bins that explain management capacity. This is largely due to their different definitions and measures. However, the most popular systems come from Brown and Potoski (2003) and Yang, Hsieh, and Li (2009). Brown and Potoski (2003) determine three subfields of management capacity: assessment, implementation, and evaluation capacities. Yang et al. (2009) build on this model by adding another measure to Brown and Potoski's system and renaming it. Therefore, formulation capacity for them is the same as implementation capacity for Brown and Potoski while Yang et al. determines implementation capacity to be the ability of the government to create and sustain a public-private partnership for contracts. This is an important delineation because many findings detail the effects of public-private partnership ability which is the capacity of the government to manage relationships and, as such, falls under management capacity.

Diving into the separate bins, contract assessment is first in the process. Yang et al. (2009) find that increased assessment capacity is positively associated with cost reduction, but it is not associated with efficiency increase or quality improvement. Additionally, Fernandez (2007), using substantively weighted least squares to statistically identify the top performers, finds that ex ante evaluation (an assessment responsibility) is a significant determinant of the most successful contracts. Moreover, Yang et al. find a time component to management capacities. For agenda setting, the "process during which the values and

preferences of stakeholders are manifested and compromised," the impact on cost reduction decreases as time passes for assessment (Yang et al., 2009, p. 687). Another aspect of assessment is the determination of asset specificity from the outset. Planning asset-specific requirements for either end product or production tasks requires significant expertise and insight. Brown and Potoski (2006) state that "managers need to master the complex production process in order to ensure that production tasks integrate with other processes required to deliver the service." However, Fernandez (2007, 2009) finds under many different statistical methods (OLS, SWLS, 2SLS) that although it is common for government managers to develop design specifications and hand it to industry to build, this is a retrograde approach, which "makes it impossible to hold contractors responsible for delivering solutions that work, because as long as what's delivered meets the specifications, it's the government's fault if the products don't work." Interestingly enough, Fernandez (2007) finds that task uncertainty is a very significant factor in diminishing contract performance. This differentiation bears the distinction that defining the asset as specifically as possible does not necessarily define what the government wants contractors to accomplish in the contract. Additionally, this suggests another side where contract specification capacity is not the problem, but rather a cultural shift away from strictly measurable design specification into more of a capability-based contract could produce more efficient and higher quality products.

As for implementation (formulation) capacities, the research is fairly anemic. These responsibilities vary but generally fall under "setting a fair bidding process, identifying the best-fit contractor, and reaching an excellent contract" (Yang et al., 2009, p. 683). Yang et al. find that an increase in formulation capacity does not affect contract performance. This is speculation, but it could be because much of this is process dependent, and much of where the human capital of capacity comes into effect is in the agenda setting stage, where a high-level of skill and expertise is needed, whereas implementation capacity, the stage for creating the actual final contract, could be most affected by personnel numbers. One requires a few highly capable people for negotiation and technical requirements creation, while the act of creating the actual contract could a require a larger number of less skilled workers, but both could have the same overall management capacity. One illuminating point by Fernandez (2009) regarding the system rather than the workers indicates that "ongoing competition between contractors during the implementation phase, rather than ex ante competition during the bidding phase, appears to be the form of competition that improves overall contracting performance" (p. 86).

As for the public-private governance capability, the literature is pretty clear-cut. There is widespread support among the evidence supporting the contract enhancing capacities of government and the private sector working together during the contracting period to increase the quality of the service. Speaking to the ability of the government in this respect, Yang et al. provide the most evidence. They use the term "to capture government agencies' active, ongoing involvement in or support for the contractor's operation. The core question involved here is, how can we help the contractor succeed?" It seems that the relationship is n-shaped, supporting the argument that, after reaching a point, extensive implementation activities may engender too much cost, red tape, and X inefficiencies. However, the function also shows that time has a magnifying effect. The impact of implementation capacity on cost reduction turns positive after the interaction efforts gain steam, and then, the impact of implementation activities on efficiency increases accelerates in that the benefits multiply as time passes, indicating that efforts to develop collaboration and mutual support will have long-term advantages (Yang et al., 2009, p. 692). Their results suggest that the government's ability to influence mechanisms such as trust, parallel expectations, and joint action hold significant potential to improve contracting performance. Additionally, Fernandez

(2009) finds evidence that joint problem-solving efforts are positively correlated with overall contracting performance.

In the last bin we have evaluation or monitoring capacity, which is the ability of the government to monitor a contractor's performance and/or enforce the contract. Yang et al. (2009) suggest that the impact of the evaluation capacity depends on its strength: a strong evaluation system is beneficial, but a weak evaluation system does no good. They also show that a "strong evaluation capacity may promote cost reduction and efficiency increases but may not help improve quality" (Yang et al., 2009, p. 691). However, they also find that the benefits of evaluation activities decrease over time. This suggests that a contract needs more evaluation in the beginning, but that once the expectations are clearly established, things run much more smoothly. On the other hand, Fernandez (2007, 2009) do not show any significance of the impact of monitoring activities in either scope or intensity while the enforcement mechanism is mixed. Fernandez's (2007) findings indicate that the most successful contractual relationships perform at higher levels when public managers make periodic use of the "stick" to enforce the contract.

> In fact, among the high performing cases, tactics such as imposing financial penalties and threatening to terminate the contract seem to enhance contracting performance more than alternative means for resolving disputes, such as negotiation and mediation, since the coefficient for reliance on alternative means for resolving disputes is not statistically significant. (Fernandez, 2007, p. 1135)

Then, Fernandez (2009) finds the complete opposite for services for the exact same dataset. This would seem completely contradictory, but Fernandez (2007) utilized SWLS to identify the top performers and then conducted an OLS analysis of the whole sample and a WLS analysis with the weights going to the high-performers. Negotiation and mediation seem to work for the overall sample, but when compared to the most successful contracts, legal enforcement and threats win the day. This heavily indicates the need to differentiate between the different types of contracts.

As for services specifically, much of the earlier literature evaluates service contracting as augmenting management capacity. Service delivery contracting includes producing the service but can also include delegating to vendors management responsibilities, such as monitoring outcomes.

> All service delivery management need not occur within government, though effective contracting clearly requires that governments maintain some management capacity. For example, even though governments can transfer some monitoring responsibilities to vendors, they likely still need to monitor their vendors' performance to some degree. (Brown & Potoski, 2006, p. 324)

Alternatively, by contracting for management responsibilities contracts and introducing third party verifiers, governments may accumulate more monitoring than they would have been able to conduct on their own (Brown & Potoski, 2006) In the case of easy-to-measure services, contract managers can focus more on outcome monitoring and less on the actual production of the service. In such cases, external monitoring becomes an attractive option, contract managers can quickly check the vendors' intensive reports against their own outcome observations. Unfortunately, these cases are only available when services are easily monitorable with specific requirements. Otherwise, delegating complex monitoring to the vendor is obviously easily susceptible to the agent opportunism problem (Brown & Potoski, 2006).

Lastly, it is important to make the distinction between in-house management capacity and overall government capacity. While some cases of governance "may indeed see the abdication of management responsibilities, cutting management staff and activities does not necessarily translate into reducing management capacity" (Brown & Potoski, 2006, p. 325). Earlier literature indicated that government outsourcing the capacity to deliver the service diminished their direct capacity to manage the service. Yet, governments can, in fact "buy" management services to adequately address their own deficits in capacity (Brown & Potoski, 2006, p. 324). This is corroborated in GAO reports of the defense acquisition workforce. For example, at the national level, many federal agencies now employ third-party evaluators to assess the quality of production activities for which they have contracted (e.g., information technology), a practice often referred to as "independent verification and validation." Therefore, while the government may have reduced their in-house capacity, the overall capacity remains the same or even increases at lower costs. The tradeoff is that contracting and other forms of alternative service delivery do not eliminate the need for management capacity, but instead create an imperative for new types of management capacities. These problems may be more likely to occur in cases such as:

- Limited or no competition among potential vendors
- Contracted products and services that are difficult to specify and describe in written contracts
- Vendors that have special knowledge or skills about the product that is unavailable to public managers
- Public managers that have a hard time monitoring vendor performance once the contract has been let. (Brown & Potoski, 2003, p. 154)

Trust/Relationships

As has been mentioned above in the capacity responsibilities, trust, joint problem-solving, and public-private partnerships have a huge impact on contracting performance. The earlier literature showed theoretical divides on the principal-agent problem and how government and the private sector should behave. Johnston and Romzek (1999) conclude that the agent's (contractor's) response to the principal's monitoring system depends on many factors such as the reliability and credibility of the system as well as the principal's willingness to enforce punishment. This game theory understanding of the principal-agent problem is complicated in government contracting as elected officials and networks of contractors add multiple layers of accountability. Additionally, "scholars have found that the overreliance on legal means of conflict resolution may evoke conflict, opportunism, and defensive behavior" (Yang et al., 2009, p. 686). Brown and Potoski (2006) provide evidence that longer contracts may also begin to mirror monopoly relationships, exposing governments to the risk that vendors will shirk their responsibilities. "Governments that entered into longer contracts spot checked vendor performance only 68 times a year on average, compared to 95 times a year, on average, for governments operating with short term contracts" (Brown & Potoski, 2006, p. 336)

As the literature matured and developed ways to measure the relationship of the government and contractors, the tone adapted. Fernandez (2007) found that the effect of joint problem-solving on contracting performance is greater among the most successful contractual relationships than in the average case. Since contract managers work more closely with the contractor's staff to solve issues that arise, the level of contracting performance tends to increase. In a later study, Fernandez found that trust has a positive independent effect on overall contracting performance and the largest coefficient in his model (Fernandez, 2009). However, some of the literature on trust suggests the possibility

of an endogenous relationship between trust and performance (Fernandez, 2009, p. 86). Fernandez then conducted a 2SLS regression to account for endogeneity. He determined that contract duration does not appear to interact with trust. That is, "the effect of trust on contracting performance does not increase as the relationship evolves over time" (Fernandez, 2009, p. 87). Additionally, he discovered that monitoring activities and trust do not serve as substitutes. Going deeper into the model as it is of great interest to this study,

> Factor analysis was used to develop multi-dimensional measures of communication, and joint problem-solving efforts after contract award. Since contracts of longer duration can facilitate learning and allow the parties more time to iron out the kinks in service delivery, the model also includes a measure of the duration of the contract, measured in months. (Fernandez, 2007, p. 1127)

Finally, there are some scattered findings throughout the literature on the effect of management responsibilities that can affect relationships. When contracts specify in great detail how a service should be delivered, the contractor may have less incentive to innovate. Additionally, "lengthy negotiations can damage the relationship between partners and inhibit their adaptation to unanticipated situations" (Yang et al., 2009, p. 686). Yang et al. argue that "information searching, contract negotiation, and contract writing" give rise to transaction costs that can offset their cost-saving benefits, and that overuse of contracts for enforcement can curtail the development of trust and collaboration (Yang et al., 2009, p. 690). As time goes on, what is more important is to develop authentic partnerships between the government and the contractor so that information can be shared and collaboration achieved (Yang et al., 2009, p. 693) As for efficiency, the overuse of contracts for enforcement may decrease efficiency, but, developing authentic partnerships during the implementation phase counteracts this, and the effect increases over time. Yang et al. go so far as to suggest that "the best contracting strategy for government is to depart from pure contracting and shift to a collaborative model such as public-private partnerships" (Yang et al., 2009, p. 692). Mentioning sub-relationships, Fernandez (2007) also examined the use of subcontractors because "arrangements involving multiple subcontractors imposes additional burdens on the prime contractor, including higher coordination costs, the likelihood of delays, and sometimes even conflict over the choice of goals and means, all of which ultimately weaken performance" (Fernandez, 2007, p. 1129). The use of multiple subcontractors was significant in the overall OLS sample but was not significant in the case of high performers. This indicates once again that it is paramount to find the distinctions between types of contracts as different types of contracts may have different mechanisms to develop trust.

Conceptual Framework and Hypothesis

This paper posits and tests a conceptual argument linking three categories of characteristics with services contract performance: first, service contract complexity; second, management capacity on the part of the buyer; and third, the strength of the relationship between the buyer and the contractor. By specifying all three characteristics, the argument captures the inherit challenges of services contracting, those most under the control of the buyer, and those most of interest to individual vendors. FPDS does not contain direct measures of these variables, and so the paper introduces proxies for each under the relevant hypothesis.

Service Complexity

The complexity of the underlying service can introduce challenges in two broad ways. First, it may raise the technical expertise required from acquisition officials. A simple service, such as lawn mowing, can be easily specified and overseen while a more complicated service, like maintaining aircraft, requires a higher level of understanding and assurance, as important problems might not be immediately visible. The second aspect of complexity is the challenge of specifying the service in clear and comprehensive terms. When acquiring new services or ones that otherwise involve significant uncertainty, acquisition officials and contractors cannot simply rely on the initial performance work statement to deliver a successful outcome but will have to flexibly incorporate changing conditions or new information. This greater requirement for partnership asks more of both buyer and vendor and leaves much room for disagreement and conflicting interest. In both cases, this complexity makes the work more demanding and thus, all else equal, raises the risks of negative contracting outcomes.

> H_1: As service complexity increases (decreases), the likelihood of cost ceiling breaches and terminations increases (decreases) and the likelihood of exercised options decreases (increases).

The paper employs two labor-based measures to attempt to capture service complexity. Service contracting inherently emphasizes labor and measures of pay, and number of employees is a metric that can be relevant across disparate forms of services contracting.

The first measure is the average salary for the North American Industrial Classification System (NAICS) detailed industry that the contract is classified under. Higher salaries may have multiple sources, but one of them is the difficulty of the work and the experience and education required.

> H_{1A}: As average salary increases (decreases), the likelihood of cost ceiling breaches and terminations increases (decreases) and the likelihood of exercised options decreases (increases).

The second measure is more services contracting specific: average cost per employee. At this stage of the research, the average cost is calculated based on averages for the given product or service code, though the study team hopes to incorporate direct contract-level measures where available in future iterations. It employs an existing government metric, called the invoice rate, that approximates how much the government is charged annually for each comparable full-time employee supporting the service contracts. A services contract with a large number of lower-paid staff would have a lower invoice rate, while one that employed a small number of experts or that had extensive capital costs would have a higher invoice rate. Similarly, a service contract that was just making contracting personnel directly available to the buyer in government facilities and using government equipment would, all else equal, have a lower invoice rate than a than one that also promised a full package of services and charged overhead for the infrastructure in place to help deliver them. As with average salary, this hypothesis assumes that scarcer labor or labor acquired at a greater premium, all else equal, indicates a more complex service.

> H_{1B}: As average cost increase (decreases), the likelihood of cost ceiling breaches and terminations decrease (increases) and the likelihood of exercised options increase (decreases).

Contract Management Capacity

Contract management capacity can manifest in a variety of forms, including assessment, contract formulation capacity, evaluation, and ability to sustain a public-private partnership. The literature affirmed the importance of this capacity, in particular for the more complex services discussed for H_1.

> H_2: As a contracting office's contract management capacity increases (decreases), the likelihood of cost ceiling breaches and terminations decreases (increases).

The first measure considered is the only one where FPDS reports on one of the capabilities discussed in the literature review: performance-based services acquisition (PBSA). Defined in FAR 37.601, PBSA tracks multiple measures relevant to public-private partnership governance including the foundation of how the contract is defined. A performance-based services acquisition "describes the requirements in terms of results required rather than the methods of performance of the work" (GSA Federal Procurement Data System, 2017, p. 52). Other characters included measurable performances standards, plans for monitoring, and the potential for monetary adjustments depending on the quality of the output.

> H_{2A}: As contract office usage of performance-based services acquisition increases (decreases), the likelihood of cost ceiling breaches and terminations decreases (increases) and the likelihood of exercised options increases (decreases).

For the other forms of management capacity, specific measures employed by prior surveys and case studies are not available within FPDS, and headcount data for contracting officers is not publicly available at the contracting office level. To capture this important but elusive variable, this paper employs a measure that scales based on the contracting office's history. This approach assumes that the throughput with a given type of product or service code correlates with the development of technical expertise. As the prior section covered, complexity and expertise requirements can vary greatly from one category to another, and a contracting office may have high capacity in one area that would not translate to a new area.

> H_{2B}: As the share of contracting office obligations for a given service code increases (decreases), the likelihood of cost ceiling breaches and terminations decreases (increases) and the exercised options decrease (increase) for that service.

Extent of Prior Relationship

The importance of partnership, trust, and handling difficult problems and uncertainty together naturally lead into the last characteristic: the relationship between the contractor and buyer. The literature suggests that a perfectly written contract is no guarantee of, nor substitute to, effective collaboration. In the absence of data directly on trust, this hypothesis focuses on the level of interaction that provides the opportunity to build a deeper relationship.

> H_3: As the extent of the government's prior relationship with its vendor increases (decreases), the likelihood of cost ceiling breaches and terminations for that partnership decreases (increases).

The first measure is the number of past years of the relationship between the contracting office and the contractors with a single transaction in a given fiscal year enough to qualify. The second measure is the number of actions on the vendors contracts with that office in the prior year. Contract action counts vary wildly from contract to contract, but even if the obligated amount per action is small, they still represent more opportunities for interaction for the office and contractor.

H_{3A}: As the number of past years of a vendor has contracted with an office increases (decreases), the likelihood of cost ceiling breaches and terminations for that partnership decreases (increases).

H_{3B}: As the number of contract actions a vendor has performed for an office in the past year increases (decreases), the likelihood of cost ceiling breaches and terminations for that partnership decreases (increases).

Data and Methods

Data Sources and Structure

The primary source of this paper is FPDS, which is the transaction database for U.S. government contracts, including military and civilian as well as products and services. With some exclusions, such as classified contracts, the U.S. postal services, and the Defense Commissary Agency, U.S. federal government contracts above a $3,500 threshold are reported into FPDS. Services contracts are delineated using the product or service codes including in FPDS, and include R&D contracting for the purposes of this report. The study team maintains their own copy of the FPDS, which has been supplemented by the ad hoc search tool and information from various data dictionaries. This and past contract datasets are freely available for download for other researchers.

FPDS data has been supplemented using the Services Contract Inventory mandated by the 2010 Consolidated Appropriations Act (GSA, n.d.). The study team continues working on importing and matching contracts from both the civilian agency data held by the GSA and the separate DoD dataset. At this stage in the research, the analysis relies not on the contract inventory itself, which is only available for larger contracts in the first place, but on the invoice rates derived for Product and Service Codes through the work of the U.S. Army. Those invoice rates are used on an annual basis to estimate the number of comparative full-time employees for contracts in the inventory that lack more detailed data. They are broken out for both Overseas Contingency Operations, which are of special interest because they imply coverage of contractors supporting military operations overseas including those directly present in Iraq and Afghanistan.

This report uses a unit of analysis of individual service contracts and task orders. These are identified in FPDS through the unique combination of a procurement identifier and, for task orders, a parent procurement identifier. The dataset is made up of completed contracts and task orders for services contracts for the DoD, completed between fiscal years 2008 and 2015.[1] Many of the variables in the dataset have been built up and tuned over three CSIS reports on Fixed-Price contracts, industrial consolidation and competition, and crisis-funded contracts (Hunter & Sanders, 2019; Hunter et al., 2019; Sanders & Hunter, 2017). Services contracts are less numerically prevalent than their products counterparts but still constitute 1.3 million contracts and task orders. At this stage of the research, 24.2% by count and 21.0% by values obligated are eliminated from the sample because of missing data. The study team believes that recent upgrades to USAspending.gov may enable a reduction in this missing data rate.

[1] Completion is measured by having surpassed the current completion date of the contract or task order by at least one year or by contract close out or a partial or complete contract termination.

The exercised options outcome variable focuses on a narrower subset of contracts and task orders, namely those with unexercised options as of their initial transaction. This reduces the count tenfold, only 103,000 contracts and task orders qualify. However, excluding these contracts from the options exercised sample is important because the choice of whether or not to include options in a contract is a contract formulation decision and not a direct reflection of performance on a given contract. The importance of contracts and task orders with options is affirmed by their value, they account for 23.7% of the total services dataset. Their missing data rate is similar to the overall dataset with a reversal between the metrics, data is missing for 20.1% of contracts and task orders by count and 23.7% by value. Henceforth in this study, for simplicity, both contract awards and task orders will be referred to simply as contracts, except in those cases where the distinction matters.

Measures of Dependent and Independent Variables

This paper focuses on the new dependent variable, options exercised, though the final report of this study will include all three variables.

Dependent Variables

Terminations evaluates whether a contract has experienced a partial or complete termination at any point in its lifespan. This includes terminations for default and convenience (partial or complete) as well as terminations for cause and legal contract cancellations. Perhaps unintuitively, this can include both a traditional cancellation of a major weapon system and the cancellation and reassignment of a contract due to a bid protest.

Ceiling Breaches is a measure that attempts to track the risk cost increases. It tracks whether a contract's cost ceiling has increased as part of a change order or definitize change order. This measure focuses on change orders, rather than modifications for additional work, because the combination of a change order and an increase in ceiling suggests an unanticipated development that will cost the acquirer more money. As shown in Table 1 both ceiling breaches and terminations are rare, though contracts experiencing ceiling breaches account for a bit under a fifth of all contract obligations. Perhaps surprisingly, overlap between these variables is small.

Table 1. Dependent Variables

Variable	Value	%of records	% of $s
Ceiling Breach	0 (None)	99.0%	81.4%
	1 (Ceiling Breach)	1.0%	18.6%
Terminations	0 (Unterminated)	99.1%	97.1%
	1 (Partial or Complete Termination)	0.9%	2.9%

Exercised Options, in contrast to the other two metrics, is a positive measure of contract performance. They reflect that the buyer has chosen to acquire additional services within the scope of the original contract and is willing to pay a higher price as a result. One common source of options is multiple year contracts where the original "base" contract only covers the first year. Both government and contractor may assume that this extension will take place with a high degree of confidence, but in strictly legalistic terms the buyer is under

no obligation to continue and may unilaterally allow the contract to end without the liability that may be incurred in a termination.

A transaction only qualifies as an exercised option if it meets all of the three following criteria:

1. The reason for modification is an exercised option, a supplemental agreement for work within scope, or a funding only action.
2. The base and *exercised* options value of the contract increases as part of the transaction.
3. The base and *all* options value of the contract does not increase as part of the transaction.

The study team used this conservative definition in order to ensure that exercised options were clearly differentiated from cost overruns. The metric is calculated in obligated dollars as follows.

$$\boldsymbol{Exercised\ Options}\ (\boldsymbol{Base} = \mathbf{1}) = 1 + \frac{\text{Change in Base and Exercised Options Value due to qualifying modifications}}{\text{Base and Exercised Options Value of the unmodified contract}}$$

Taking a simple example, imagine a five-year contract with a ceiling of $50,000 that starts with a base of one year and $10,000. If no options were ever exercised the value of metric would be steady at 1 (1+$0/$10,000). If a $10,000 second year option was exercised, then then the metric would rise to 2 (1+$10,000/$10,000). If all four options were exercised, then the metric would rise to 5 (1+$40,000/$10,000). The variable is logged, but not centered because it is an outcome variable.

Variable Name	Min	Max	Median	Geometric Mean	1 Unit Below	1 Unit Above	% of Records NA	% of Obligation to NA Records
Exercised Options	1	58,837,341	1	1.047	0.642*	1.706	0.287%	0.418%

* 1 Unit below value below minimum value.

Study Independent Variables

Service Contract Complexity

Average Salary: Each contract in FPDS is labeled by its NAICS Detailed Industry category, the most granular level available. The U.S. Economic Census provides enough data to calculate average wage, although it is only available every five years and thus has a variable lag based of one to five years based on the time since the last census.

Invoice Rate: What is the average annual charge rate for comparable full-time employees. The invoice rate is available through the Service Contract Inventory and is dependent on U.S. Army calculations at the individual Product or Service Code level or for

the broad service category.[2] When the invoice rate for a specific product or service code is available for the prior fiscal year, that factor is used. When the invoice rate is available for a code but not for the prior year, the average across all years is imputed. For those codes with no reported invoice rates, the broad service code is used instead for that year if available, and an average of the invoice rate for all available years is used otherwise.

Table 2 shows the descriptive statistics for these variables, which are logged and rescaled in the model.

Table 2. Average Salary and Invoice Rate

Variable Name	Min	Max	Median	Geometric Mean	1 Unit Below	1 Unit Above	% of Records NA	% of Obligation to NA Records
Average Salary	$8,690	$24,7576	$54,192	$50,890	$22,358	$115,834	2.83%	0.899%
Invoice Rate	$9,710	$1,762,137	$170,918	$167,767	$63,862.	$440,726.2	7.53%	13.0%

Contract Management Capacity

Partnership (Lagged): What share of office obligations for a given office were for Performance Based Services Contracting in the prior year.

Service Experience: For any given contract, what percentage of obligations for the office went to contracts with the same product or service code over the past seven years. Table 3 shows the descriptive statistics for these variables, which are rescaled in the model.

Table 3. Partnership and Service Experience

Variable Name	Min	Max	Median	Arithmetic Mean	1 Unit Below	1 Unit Above	% of Records NA	% of Obligation to NA Records
Partnership	0%	100%	27.8%	33.9%	-26.2%*	93.9%	0.03%	0%
Service Experience	0%	100%	1.9%	14.0%	-37.9% *	62.7%	0.03%	0%
Paired Years	0	7	4	3.49	-1.35*	8.33*	0.147%	0.344%

* 1 unit below values are less than minimal value for variable.

Extent of Prior Relationship

Paired Years: For any given contract's vendor and office pairing, how many of the past seven years involved interaction between the vendor and the office. For a new relationship, this value would be zero. Table 43 shows the descriptive statics for this variable, which is rescaled in the model.

[2] Product or Service Codes have four characters. Services codes start with a letter, while product codes start with a number. The broad services category (e.g., the letter Y for construction or the letter D for automated data processing) refers to the first letter of the services code.

Paired Actions (Lagged): For any given contract's vendor and office pairing, how many contracting actions did the vendor perform for that office across all contracts in the prior year. Table 43 shows the descriptive statistics for this variable, which is incremented by 1 to make zeros eligible for logarithmic transformation and is then logged and rescaled.

Table 43. Paired Actions

Variable Name	Min	Max	Median	Geometric Mean	1 Unit Below	1 Unit Above	% of Records NA	% of Obligation to NA Records
Paired Actions	1**	7,806,579	26	32.751	0.5 *	2,249	0.032%	0.013%

* 1 unit below values are less than minimal value for variable. ** True minimum value is 0.

Empirical Approach

At this stage of the research, the study team has created the exercise options models for each of the independent variables. The study used ordinary least squares regression to analyze the logged proportion of growth in exercised options compared to the base. The additional models for the other two dependent variables, ceiling breaches and terminations, will be added at a subsequent stage of the study but will use a broadly similar structure. Those additional models are presently intended to use maximum likelihood logit analysis, as they are presently structured as binary variables.

For all of these models, the study team captures the residual differences between the contracting office and agencies, the detailed industries and sub-sectors, and the countries of performances through the use of multilevel modeling techniques. This approach adopts techniques employed by Gelman and Hill (2017) and Sommet and Morselli (2017) that allow for a different intercept for each of the hierarchical industrial sectors, customers, and places of performance. These are referred to as level 2 and 3 variables, with the level 2 variables, office, and detailed NAICS6 nested under the level 3 variables, agency, and NAICS3. The five multilevel groupings employed in this model are shown in Table 5.

Table 5.. Level 2 and Level 3 Variables Included in the Model

Name	Level	Type	Description
NAICS3	3	Categorical	Subsector Code with 108 groups for services contracts within the study period.
NAICS6	2	Categorical	Detailed Industry Code with 1m069 groups for services contracts within the study period.
Agency	3	Categorical	Contracting Agency Code with 24 groups for services contracts within the study period.
Office	2	Categorical	Contracting Office Code with 1,185 groups for services contracts within the study period.
Place	2	Categorical	Country in which the contract was performed with 198 groups for services contracts within the study period.

The more traditional level 1 inputs, in addition to the study variables discussed in the prior section, included three varieties of inputs as controls. The first category focus on the pairing of the contract's vendor and office and are new to this paper.

- Office and vendor-office pair variables:
  - Office Volume: Total office obligations in the prior seven fiscal years.
  - Office Count: Number of distinct contracts and task orders the office managed in the prior fiscal year.
  - Market Share: What percentage of an office's obligations are accounted for by this vendor. This can be driven by a multitude of factors, including

general vendor success and size regardless of the relationship with a given office. A high value in this variable may reflect vendor lock.

- Subsector-level and detailed industry variables:
  - Both levels included the Herfindahl-Hirschman Index measures that consolidation measures.
  - Both levels also include the ratio of total defense obligations to U.S.-wide revenues.
  - In addition, the defense obligations for each detailed industry are added to the model.
- Contract-level variables:
  - Scope as measured by initial contract ceiling and duration.
  - Competition, which has a baseline of no competition and three alternatives: competition, available for competition but receiving only 1 offer, 2–4 offers, 5+ offers.
  - Vehicle, which has a baseline of definitive contracts and purchase orders, but also includes four types of indefinite delivery vehicles: Single-Award IDCs (S-IDC); Multi-award IDCs (M-IDCs); Federal Supply Schedule or Government-Wide Acquisition Contract (FSS-GWAC); and Blank Purchase Agreement or Basic Ordering Agreement (BPA-BOA).
  - Pricing, which uses firm-fixed price as a baseline with six alternatives handled by dummy variables: incentive fee contracts (whether fixed price or cost-based), combination; combination or other contracts which include multiple types, time and materials, labor hours, or fixed price: level of effort (T&M/LH/FP:LoE); other fixed price (other FP) including all types of fixed price not covered by earlier categories; whether the contract began as an undefinitized contract award (UCA); and other cost-based (other CB) covering all types of cost-based contracts not covered by earlier categories.
  - Crisis Funding: Baseline of drawing from non-emergency accounts with three alternatives for OCO, disaster response, and the Recovery Act (ARRA).

Preliminary Results and Discussion

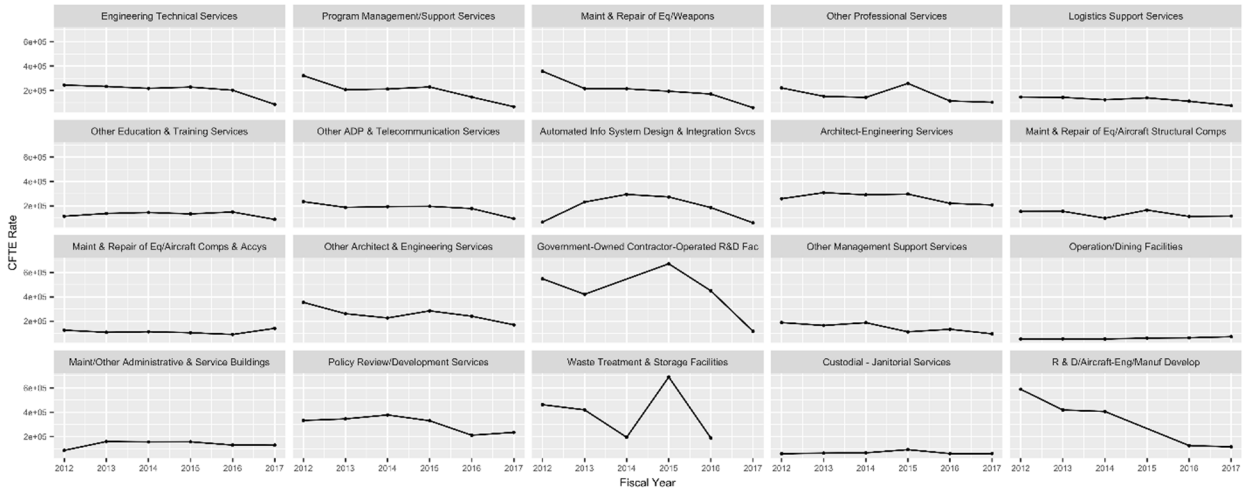
Inventory of Contracts Services

The Inventory of Contracted Services (ICS) is mandated across the federal government and has an obvious value to this project above and beyond the inclusion of the invoice rate variable. By statute, the DoD has a separate inventory process from the GSA process that includes extracting contract data from the Federal Procurement Data System (FPDS) and the System for Award Management (SAM). The study team analyzed ICS data from both the DoD and the GSA to better understand service contract complexity and found that each source has its own set of challenges. Generally, since FY 2012, DoD ICS data includes comparable contractor full-time equivalents (CFTE) related information with clear ICS guidance and information available. GSA ICS data by comparison is easier to import because it is not spread across many, somewhat inconsistent, Excel tabs. However, GSA ICS relies on supplemental documents for explanation and has not published these supporting documents at all for some years since the start of the ICS, posing difficulties in cross-checking and reference.

According to CSIS data processing methods, three-stage standardization was applied to the raw data from government websites. The main challenge along the procedure

was the inconsistent format in which the data was reported and published, which potentially complicated the consolidation process before import to CSIS database system, especially for validating data type, generating unique identifiers, etc. Additionally, inadequate explanation of the certain amount of missing values hinders the utility for further analysis.

Figure 5. Comparable Full-Time Employee Invoice Rate of Top 20 Prime Service Code (Ordered Horizontally by Invoice Amount)



Nonetheless, the study team was successful in importing and using key DoD guidance documents. One key piece of the results is shown Figure 5 where the invoice rates for top 20 service codes are shown, listed by volume. The broad patterns align with expectations: "Operation/Dining Facilities" and "Custodial–Janitorial Services" have the lowest invoice rates. By comparison, more complex services like "Government-Owned Contractor Operated R&D Facilities" and "Architect-Engineering Services" are fairly high. However, this investigation did reveal oddities in the later years, with multiple categories suddenly declining in 2016 and with some categories collapsing their rate in 2017. Sometimes the end of a single large contract can do a great deal to explain fluctuations, as the study team found with Waste Treatment & Storage Facilities, but that explanation did not hold in other cases. Because this variable is defined to use lagged data, the 2016 and 2017 invoice rates are not included in any of the statistics; that said, the study team intends a closer examination of this issue as one of the next steps of this project.

Bivariate Analysis of Study Variables

The first step in model building is to look at the relationship of each of the study variables to the output variables. Table 6 shows the minimal logit model, not yet including controls or multiple levels, for the six variables covered in the hypotheses. Each variable is examined one-on-one followed by Model 7 which includes all six variables. When analyzing these coefficients, the greater the magnitude of the coefficient, the greater the estimated risk of ceiling breaches.

Table 6. Logit Bivariate Look at Study Variables and Ceiling Breaches

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
(Intercept)	**-2.83** (0.01)***	**-2.83** (0.01)***	**-2.83** (0.01)***	**-2.88** (0.01)***	**-2.83** (0.01)***	**-2.82** (0.01)***	**-2.89** (0.01)***
Services Complexity							
Log(Det. Ind. Salary)	**0.12** (0.02)***						-0.03 (0.02)
Log(Service Invoice Rate)		**0.15** (0.02)***					**0.16** (0.02)***
Office Capacity							
Office Perf.-Based %			**0.14** (0.02)***				**-0.16** (0.02)***
Office Service Exp. %				**0.66** (0.01)***			**0.72** (0.02)***
Past Relationship							
Paired Years					**-0.10** (0.02)***		**-0.20** (0.02)***
Log(Paired Actions)						**0.29** (0.02)***	0.03 (0.02)
AIC	107637.39	107605.76	107621.00	105650.20	107646.22	107430.81	105389.27
BIC	107658.25	107626.62	107641.86	105671.06	107667.08	107451.67	105462.28
Log Likelihood	-53816.69	-53800.88	-53808.50	-52823.10	-53821.11	-53713.41	-52687.64
Deviance	107633.39	107601.76	107617.00	105646.20	107642.22	107426.81	105375.27
Num. obs.	250000	250000	250000	250000	250000	250000	250000

***p < 0.001, **p < 0.01, *p < 0.05, ·p < 0.1. Numerical inputs are rescaled.

When considered alone, both measures of service complexity match H_1 as higher salaries and invoice rates estimate a higher risk of ceiling breaches. However, when both variables are included in the same model, only the Service Invoice Rate remains significant and the direction of the relationship for average salary flips. For Office capacity, the individual results do not support H_2, as both the percent of performance-based services an office performs and the office share of experience with a given service predict a higher rate of ceiling breaches. When the variables are combined, H_{2A} is supported but H_{2B} is not. A look at summary statistics for Performance-Based experience did find that as the percent of performance-based service went from 0% to 75%, the ceiling breach rate declined. Above 75%, it rose dramatically, suggesting an additional variable may influence that relationship. The results were also mixed for H_3, as more paired years of history was associated with fewer breaches while more contracting actions between the office and the vendor in the prior year was associated with more. When all the study variables were included, the results for H_{3A} remained significant and the results for H_{3B} lost significance.

The next output variable is terminations and the bivariate results are shown in Table 7.

Table 7. Logit Bivariate Look at Study Variables and Terminations

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
(Intercept)	**-4.04** (0.02)***	**-4.04** (0.02)***	**-4.04** (0.02)***	**-4.06** (0.02)***	**-4.04** (0.02)***	**-4.04** (0.02)***	**-4.06** (0.02)***
Services Complexity							
Log(Det. Ind. Salary)	**-0.12** (0.03)***						**-0.25** (0.04)***
Log(Service Invoice Rate)		-0.03 (0.03)					0.06 (0.03)·
Office Capacity							
Office Perf.-Based %			**0.17** (0.03)***				0.00 (0.03)
Office Service Exp. %				**0.41** (0.03)***			**0.28** (0.03)***
Past Relationship							
Paired Years					-0.03 (0.03)		**-0.25** (0.04)***
Log(Paired Actions)						**0.50** (0.03)***	**0.51** (0.04)***
AIC	43737.75	43751.99	43723.28	43523.03	43751.85	43508.97	43317.42
BIC	43758.60	43772.85	43744.14	43543.88	43772.71	43529.83	43390.43
Log Likelihood	-21866.87	-21873.99	-21859.64	-21759.51	-21873.92	-21752.49	-21651.71
Deviance	43733.75	43747.99	43719.28	43519.03	43747.85	43504.97	43303.42
Num. obs.	250000	250000	250000	250000	250000	250000	250000

***p < 0.001, **p < 0.01, *p < 0.05, ·p < 0.1. Numerical inputs are rescaled.

The termination results, with a single exception, do not support the hypotheses or are not significant. For H_1, higher average salaries predict a lower risk of terminations. The relationship with invoice rate does predict a lower risk of terminations once all six variables are included, but is only significant with a p-value <0.1. For H_2 both office capacity variables estimate a higher risk of termination in isolation and the office use of performance-based services contracting has no estimated influence on outcomes once all six variables are

included. The one place the hypotheses finds support is H_{3A}, paired years, which estimates a lower risk of termination, but only once all six variables are included. Paired actions is significant in both cases, but estimates a greater, not a lesser, risk of terminations.

The final output variable is options exercised, which involves two important changes in interpretation. First, this model uses regression because it is estimated the amount of growth attributable to options and not simply whether or not any options were exercised. Second, for the prior to variables, negative coefficients are associated with better outcomes, that is, fewer ceiling breaches and terminations. For Table 8, the direction is reversed, as positive values in the coefficient indicate that proportionally larger options are likely to be awarded. Finally, note that the number of contracts in the sample drops dramatically, as contracts with available options are less common, though higher in value on average.

Table 8. Regression Bivariate Look at Study Variables and Log(Options Growth)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
(Intercept)	**0.65** (0.00)***	**0.63** (0.00)***	**0.62** (0.00)***	**0.62** (0.00)***	**0.62** (0.00)***	**0.63** (0.00)***	**0.66** (0.00)***
Services Complexity							
Log(Det. Ind. Salary)	**-0.19** (0.00)***						**-0.14** (0.01)***
Log(Service Invoice Rate)		**-0.21** (0.00)***					**-0.14** (0.01)***
Office Capacity							
Office Perf.-Based %			**-0.06** (0.01)***				**-0.06** (0.01)***
Office Service Exp. %				**0.10** (0.01)***			**0.14** (0.01)***
Past Relationship							
Paired Years					**-0.01** (0.00)**		**-0.04** (0.01)***
Log(Paired Actions)						**0.06** (0.00)***	**0.07** (0.01)***
AIC	165175.62	165387.96	167067.06	166831.95	167195.69	167039.85	163626.85
BIC	165203.59	165415.93	167095.03	166859.92	167223.66	167067.82	163701.43
Log Likelihood	-82584.81	-82690.98	-83530.53	-83412.97	-83594.85	-83516.93	-81805.42
Deviance	35689.57	35781.35	36515.49	36411.79	36572.34	36503.47	35022.97
Num. obs.	82675	82675	82675	82675	82675	82675	82675

***p < 0.001, **p < 0.01, *p < 0.05, ·p < 0.1. Numerical inputs are rescaled.

The options variable presently offers the strongest support for the hypothesis. As per H_1, both individually and together, higher salaries and invoice rates estimate lower value of exercised options. For H_2, office capacity, the result is split. Greater experience with performance-based services is associated with a lower value of exercised options while office experience with a given service is associated with a greater value in exercised options. The support for H_3 is also split, where paired years are associated with lesser growth in options exercised while paired contracts actions in the prior year are associated with more options.

Next Steps

The study team is presently incorporating a range of controls into all three models. Of particular interest are the controls for contracting office and the office-vendor relationship, which might help clarify the initially contradictory results for H_2 and H_3. The study team is also looking at whether converting to constant dollars, perhaps using the contract start year for deflation purposes, is an option, as temporal effects could be particularly important for invoice rates and salaries, as both tend to rise over time. Additional attention to quality issues in the services contract inventory is also planned, as the information captured by the inventory is of great interest, but the initial analysis and importing process revealed a variety of data quality challenges. The study team is looking with interest whether, after introduction of controls, some hypotheses retain split decisions. For example, more years of paired experience estimates a lower risk of ceiling breaches and terminations, but also a lesser growth in exercised options.

References

Brown, T. L., & Potoski, M. (2003, March 4). Managing contract performance: A transaction costs approach. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1002/pam.10117

Brown, T., & Potoski, M. (2006, March 2). Contracting for management: Assessing management capacity under alternative service delivery arrangements. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1002/pam.20175

GSA. (n.d.). *Service contract inventory*. Retrieved from https://www.acquisition.gov/service-contract-inventory

GSA Federal Procurement Data System–Next Generation (FPDS-NG) Data Element Dictionary. (2017, November 10).

Hunter, A. P., & Sanders, G. (2019, April 2). *Avoiding terminations, single-offer competition, and costly changes with fixed-price contracts*. Retrieved from https://www.csis.org/analysis/avoiding-terminations-single-offer-competition-and-costly-changes-fixed-price-contracts

Hunter, A. P., Sanders, G., McCormick, R., Meitiv, A., Nzeribe, G., & McQuade, M. R. (2019, April 2). *Evaluating consolidation and the threat of monopolies within industrial sectors.* Retrieved from https://www.csis.org/analysis/evaluating-consolidation-and-threat-monopolies-within-industrial-sectors

Joaquin, M. E., & Greitens, T. J. (2012, August 23). Contract management capacity breakdown? An analysis of U.S. local governments. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1540-6210.2012.02587.x

McCormick, R., Hunter, A. P., Sanders, G., Cohen, S., & McQuade, M. R. (2015, September 30). *Measuring the outcomes of acquisition reform by major DoD components*. Retrieved from https://www.csis.org/analysis/measuring-outcomes-acquisition-reform-major-dod-components

Romzek, B. S., & Johnston, J. M. (2002, July 1). Effective contract implementation and management: A preliminary model. Retrieved from https://academic.oup.com/jpart/article-abstract/12/3/423/909448?redirectedFrom=fulltext

Sanders, G., & Hunter, A. P. (2017). *Overseas contingency operations contracts after Iraq: Enabling financial management research and transparency through contract labeling*. Retrieved from https://www.researchsymposium.com/conf/app/researchsymposium/unsecured/file/145/SYM-AM-17-051-005_Sanders.pdf

Witesman, E. M., & Fernandez, S. (2013, August). Government contracts with private organizations. Retrieved from https://journals.sagepub.com/doi/abs/10.1177/0899764012442592

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